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ARBORETUM BULLETIN

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Concerning This Issue . . .

The seasons, when measured by pages torn off a Gary Larson desk calendar, have come full circle to winter. The view to the water has opened up from my perch in the Arboretum and I daydream about the houses I've been looking at to buy. One of my favorites can only accommodate a garden so small that with glue on the back it would be a postage stamp.

Gardeners everywhere are contemplating both the pleasures and challenges of the winter season. Some people will hibernate. Others may fly the coop. Before settling in or taking off, you can prepare the "coop" against winter's harsher side. On these pages, we address concerns about safekeeping your garden, as well as enjoying winter's beauty.

British author Rosemary Verey is associated with the garden in winter. Steven Lorton, Northwest Editor of *Sunset Magazine*, profiles Verey, highlighting both her estate and her "seasoned" philosophy.

With the change of seasons, we've watched our new editorial board member, Jan Pirzio-Biroli, come full circle in her career. This former editor of the *Bulletin* has cycled from volunteer to professional naturalist, back into alleged retirement—again as an Arboretum Foundation volunteer. Jan's article on winter in the Arboretum leads us boldly through the subtleties of the season, making winter's nuances exciting.

How did the Arboretum actually fare last winter? Curator Timothy Hohn reports on its trials and tribulations in his winter column. Three of Washington State University's cooperative extension professionals also team up to offer advice on preparing for this current winter season: Ray Maleike helps us prepare for winter cold damage; Arthur Antonelli discusses how to protect trees with non-toxic dormant oils; and, on the aesthetic side, Mary Robson chooses bulbs for winter bloom.

Witch hazel lends its foliage colors and flower to this season in Timothy Hohn's article. Then Kelly Dodson assesses the flowering rhododendron species that bring color from now through March. And when you're ready to purchase the plants you read about or are told to find by your landscape designer, Valerie Easton explains how to locate them.

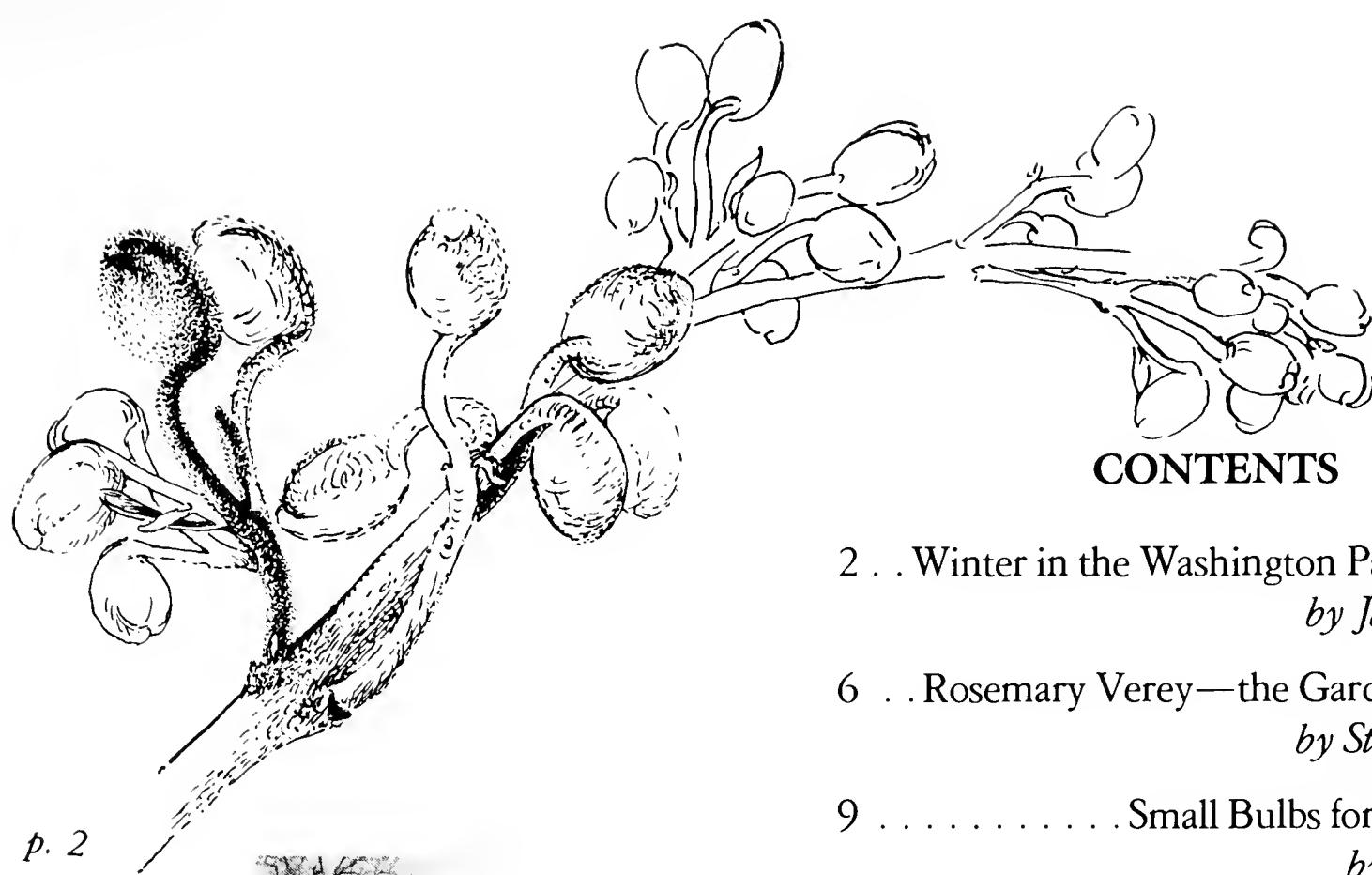
Late fall saw the passing of former editorial board member Kendall Gambrill, too early in his life. Ken was among the first to find sponsors for the color you see on these pages, and to lend his expertise on rhododendrons. A man of talent and humor, Ken Gambrill typified the spirit and generosity we are so fortunate to find in the Washington Park Arboretum.

Jan Silver, Editor

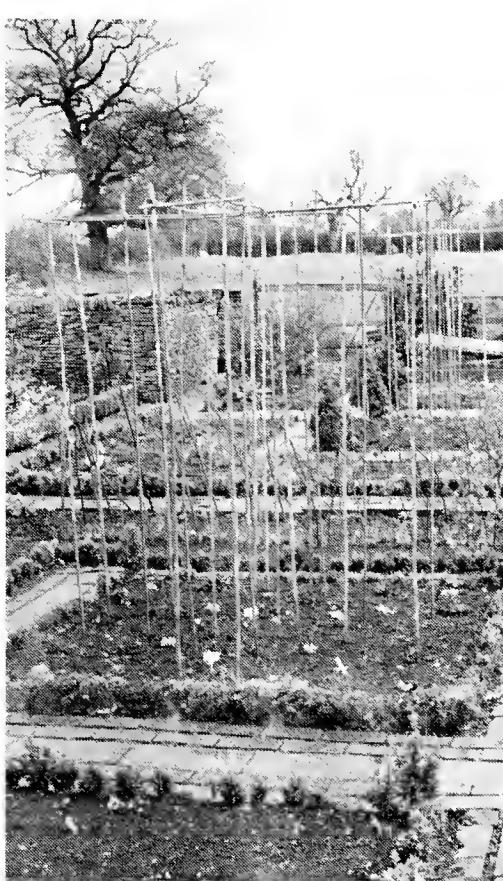
The Washington Park Arboretum Bulletin

Cover: a late winter bud of *Rhododendron lanigerum*—the promise of spring. This northeast Indian species blooms from February through March in the Pacific Northwest. Photo by Lynn Watts of The Greenery, specializing in species rhododendrons and new hybrids.

We dedicate this cover to the memory of Kendall Gambrill.



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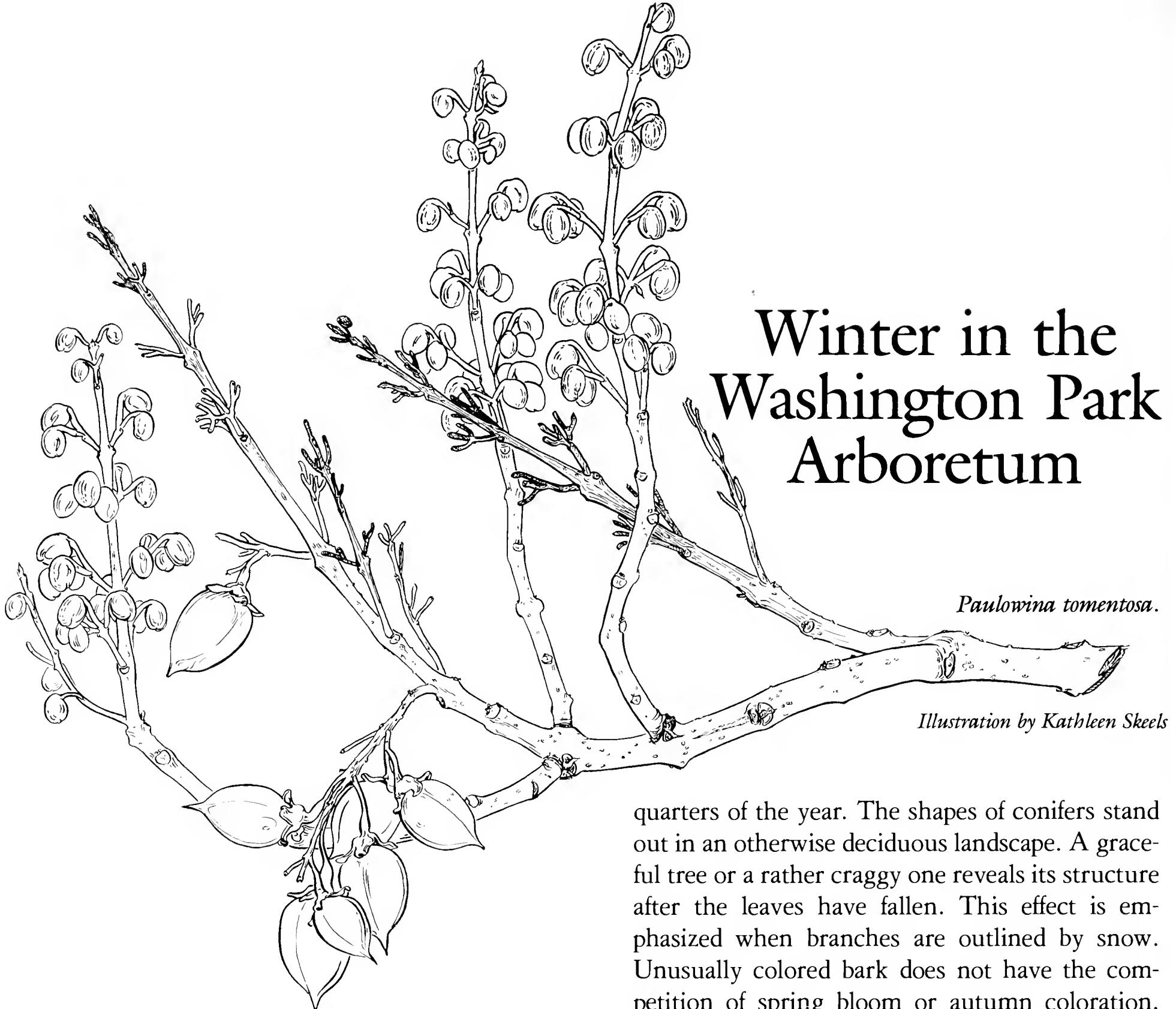
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In Bulletin articles, an asterisk () indicates species, including varieties and/or forms, that can be found in the Washington Park Arboretum; a dagger (†) indicates specimens in the public collections of the University of Washington's Center for Urban Horticulture.*

The Washington Park Arboretum Bulletin is published quarterly, as a bonus of membership in The Arboretum Foundation. The Arboretum Foundation is a non-profit organization that was chartered to further the development of the Washington Park Arboretum, its projects and programs, by means of volunteer service and fund-raising projects. The Washington Park Arboretum is administered through cooperative efforts between the University of Washington, its Center for Urban Horticulture, and the City of Seattle Department of Parks and Recreation. The programs and plant collections are a responsibility of the Center for Urban Horticulture.

The mission of the Arboretum Foundation is to ensure stewardship for the Washington Park Arboretum, a Pacific Northwest treasure, and to provide horticultural leadership for the region. This stewardship requires effective leadership, stable funding, and broad public support. For membership information, write to The Arboretum Foundation, University of Washington (XD-10), Seattle, WA 98195 or call (206) 325-4510. Articles on gardening and horticulturally related subjects are welcome. Please call for guidelines. For permission to reprint any part of the *Arboretum Bulletin*, please contact the Arboretum Foundation for written permission. © 1991 The Arboretum Foundation.

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by Jan Pirzio-Biroli

The Arboretum in winter is comparable to a garden at night. At night, I hear the small sounds that are suppressed in daytime by traffic, human voices, chain saws, washing machines—those many processes of daily life. In their absence, I hear, instead, the pervasive undertone produced by the multitude of creatures that are active after dark. Occasionally, the evocative rumble of a freight train sounds in the distance. Before dawn, the songs of wakening birds are a welcome concert.

Similarly, the Arboretum in winter offers views and vistas generally hidden by leaves for three

Glossary

Inflorescence is the flower cluster of a plant.

Panicle is a branched flower cluster.

Pedicel is the stalk of a single flower.

Tomentum is a downy-appearing cover composed of matted, woolly hairs that usually persist for the life of a rhododendron leaf.

Winter in the Washington Park Arboretum

quarters of the year. The shapes of conifers stand out in an otherwise deciduous landscape. A graceful tree or a rather craggy one reveals its structure after the leaves have fallen. This effect is emphasized when branches are outlined by snow. Unusually colored bark does not have the competition of spring bloom or autumn coloration. Textures of evergreen plantings chosen for their winter effect assume additional meaning. Flowers of winter-blooming species are more valued because they offer a display that is rare at this season. Following are a few examples chosen from hundreds of favorites.

The traditional subject for views in the Arboretum is Azalea Way, for which the traditional viewpoint is the Lookout (located west of the Camellia Collection, below Arboretum Drive East). From there, one can see a portion of Azalea Way to the north until it disappears at a curve near midpoint. In winter, a more intimate scene opens from above the forested southwest corner of Woodland Garden, again looking north. The still-green swath of turf is bordered by conifers on the west. In the foreground, a small, graceful Japanese maple with copper bark frames the view; its warm tones are enhanced in early March when the young reddish leaves appear.

From the Lookout itself, the “flats” below emerge in winter. Trunks of birches whose bark varies from white to gray or occasionally pink, contrast with the yellow-green and purple masses

of red-osier dogwood stems. Toward the northwest, a superb specimen of our native grand fir (*Abies grandis*) stands alone against the sky, its narrow cone an imposing guardian near the boulevard. Surprisingly, the east slope of Seattle's Capitol Hill district presents an interesting combination of vegetation and diverse architectural styles.

On sunny days, the island north of Duck Bay sparkles with the white trunks of European birches (*Betula pendula*), and the wispy golden branches of native willows that have seeded in since the Arboretum was founded in 1934. They form an unbroken medley of color, a backdrop for the V-shaped ripples left by ducks swimming toward the shore in stately procession.

A much-loved group of conifers is the "ghost trees," as they are called by some of the Arboretum guides when they introduce children to the pendulous forms of the Alaska yellow cedars (*Chamaecyparis nootkatensis*). These and other conifer species grow west of Azalea Way and south of the service road to the Lynn Street bridge. They are handsome on a clear day. When the mists come in, the distance between each is emphasized by layers of moisture, an effect that is present everywhere in the Arboretum on a foggy day.

The imposing pair of big-leaf maples (*Acer macrophyllum*) on Arboretum Drive East at the Brian O. Mulligan *Sorbus* Collection, have a sculptural effect, their major—nearly horizontal—



Above, branches of the Kentucky coffee tree (*Gymnocladus dioicus*) with close-up of bark (below). Lower left, *Stewartia monodelpha*.





Joy Spurr

branches sweeping southward and overlapping each other. In winter, their form is emphasized when continuous moisture has increased the layers of mosses on the bark, and the colonies of licorice fern (*Polypodium glycyrrhiza*) flourish after their period of summer dormancy. In contrast, south of the *Sorbus* collection is a gaunt pair of Kentucky coffee trees (*Gymnocladus dioicus*) with coarse bark and awkward branches reaching toward the sky.

Japanese maples (*Acer palmatum*) are well known for the variety of shape and color of their leaves. Apart from those attributes, in winter these deciduous cultivars excel in grace of form. They range from those with delicate, widespread crowns, to dissected leaf forms whose multiple branches spread widely near the ground, assuming a contorted shape in maturity. Alternatively, the stripebark maples—*A. davidii*, *A. rufinerve*, and *A. tegmentosum*, for example—often are sparse in outline. Their glaucous vertical markings, however, seem to become more intense in winter, possibly the effect of moisture and cold, but also because the bare branches are more effectively revealed. The paperbark maple (*Acer griseum*) sheds satiny orange bark in curling plates and strips to reveal paler wood beneath. Although its autumn foliage is spectacular, this year-round tree suffers not at all when it stands without leaves in winter.

Stewartia monadelpha represents a combination

Licorice fern (*Polypodium glycyrrhiza*) on western maple (*Acer macrophyllum*). Below, trunks of birches on Foster Island in the Washington Park Arboretum.



Brian O. Mulligan

of graceful outline and handsome bark. The delicacy of its numerous slender branchlets is emphasized, especially in the specimens with two or three trunks spreading from near the base. The finely shredding bark is a cinnamon color, fairly uniform throughout. A related species, *S. pseudocamellia*, sheds its bark in plates to reveal a pattern and color reminiscent of more subtle examples of camouflage cloth.

Line, color, and texture are combined in the empress tree (*Paulownia tomentosa*) whose flower buds and fruits, borne in panicles, develop in late summer and remain together throughout winter on muscular, smooth gray branches. The capsules are ovate and woody, about 1½-2" long. The flower buds would be sufficient decoration, even without their promise of huge lavender flowers in spring. The 12" inflorescence is clothed in golden tomentum with small globose individual buds at the tips of numerous pedicels.

A recent planting north of the greenhouse uses varied evergreen species that offer year-round value for color and texture contrasts. These include *Eucalyptus*, *Podocarpus*, palms (*Trachycarpus fortunei*), and several grasses in varying forms and colors, contrasting with the voluptuous shining leaves of *Bergenia*, blooming in pinks and rose during winter.

The Joseph A. Witt Winter Garden offers many contrasts, textures, forms, and colors, in addition to a plethora of flower and fragrance. A single example is the bloom of cornelian cherry (*Cornus mas*), which stands on the south slope. In February or early March, the haze of lemon-yellow flowers on branches devoid of leaves is especially beautiful when backlit by the winter sun. When its flowers have faded, an interesting repetition occurs somewhat to the east in the Woodland Garden where the male inflorescences of *Lindera obtusiloba* offer almost the same effect.

Like the small sounds of night, a walk through the Arboretum in this subtle season offers a multitude of surprises for us all.

Jan Pirzio-Biroli retired this year as naturalist for the Washington Park Arboretum and University of Washington Center for Urban Horticulture. She is a former editor of the *Washington Park Arboretum Bulletin*, and recently started a new term as member of the *Bulletin's* editorial board.

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Rosemary Verey with the author's son, Willie, in the Barnsley House garden.

Rosemary Verey— the Gardener in Winter

**Photos and text
by Steven R. Lorton**

On the same page as Rosemary Verey's telephone number in my May 1985 travel journal, I ran into a quote I'd jotted down the day before my first visit with her, at her famous garden in Barnsley, northern England.

"A gardener must have a firm grasp of quality and form, and still be comfortable with the unruliness of nature. A gardener must see the big picture while focusing on every detail."

I can't remember where I heard it. That's one of the engaging things about Britain. You hear so many wonderful things said about gardening, you

just don't bother remembering who said what.

Anyway, I needed to talk to Rosemary about a story I was doing on her garden in winter to be timed with the 1988 release of her book, *The Garden in Winter*. I picked up the phone and dialed. It was early morning there; a cold, crystal-clear winter day on this side and matched, I was to find out, by the weather in the Cotswolds. The phone gave its funny little English *burr-ring* twice and came off the hook. "Hello," said a deep throaty morning voice that sounded more like Marlene Dietrich than an English country lady.

"Rosemary, it's Steve in Seattle. How are you?"

"Lovely, thank you. I was just lying here looking out my bedroom window at the young red twigs of the lime trees. You call them *linden*. **Tilia*. And I'm thinking, could anything be more beautiful?"

That's how Rosemary is—paying attention, taking it in, responsive and communicative, of the moment. It's little wonder that she's turned out 12 excellent books on the art of gardening. Her

**Laburnum* way, I'd speculate, is the single most published garden image to come out of Britain. And she regularly jets across the Atlantic to lecture, judge shows, and design gardens.

She likes Americans, too! I asked her if she did

videos have me running around in rawhide and a coonskin cap.

We toured her garden. "When I find a plant I like and I can't figure out where to use it," she said, "I often ask myself where *wouldn't* this plant work." We passed a bed of *Polygonum bistorta* 'Superbum'. She said it was her idea of an excellent plant. I said I hated it. "I don't know how a person could think that," she said in gracious disbelief. "They just look like weeds to me," I said. She invited my family and me into the house for a lovely lunch, anyway. And so began an important friendship for me.

Forget the fact that Rosemary is a prolific gardener and writer, that she's spent much of her life in a huge seventeenth century house in the Cotswolds, that if someone claimed she were the Queen's first cousin, you'd believe it. Rosemary Verey is a human being of enormous substance.

In February 1990, Duane Kelley had invited her over to judge and lecture at the Northwest Flower and Garden Show. Her agenda was packed, but Rosemary had corresponded with painter and plantsman Kevin Nicolay and she wanted to visit him.

Sadly, by that time, Kevin was in the last

stages of AIDS. Rail thin, but dressed to the nines, even with a fancy hat cocked on his head to hide a sick and molting scalp, Kevin let us in and refreshments were served. Rosemary was bright and chatty, almost girlish in her demeanor. We talked of plants and gardening, laughed, and had a grand time.



Strong form and garden structure anchoring the unruliness of carefully selected plants is the substance of British gardening.

the first day I met her. "I do like Americans. There's an open sweetness there that I find endearing."

That melted my heart. The British strike me as so polished, so self-assured, so smooth and well turned out that whenever I'm there my mental



Patterns are very important to Rosemary Verey.

Note stone paths, vegetable garden beds, garden chair, wall, and bare branches of deciduous trees—even ancient Barnsley House rising in the distance.

When Kevin became noticeably tired, Rosemary said she was sorry but she really needed to go. There were cheerful hugs and good-byes. But when we got to the car, Rosemary was quite shaken.

For the rest of the trip, simple, understated references to the sadness of Kevin's condition materialized repeatedly in her conversation. Shortly after the visit, Kevin died. But when Rosemary signed off her tenth book, *The American Man's Garden*, she remembered her Seattle visit and, I think, her own deep feelings. She dedicated the book to Kevin.

On the same trip, I remember her at Pike Place Market enthusiastically chewing a knockwurst from a fast-food restaurant and raving about the low price of salmon. She adored Seattle's public market.

During dinner at my house one night she asked, "Was that a **Cornus* 'Eddie's White Wonder' I saw near the entry to your drive?" I said it was. "I thought so, I used one in Sir's

garden." My ears spread out and rotated in her direction like radar disks. *Sir* is Prince Charles! Rosemary works with him on his garden at Highgrove. I knew I'd get the light touch if I asked her about the Prince then, so I just reached for the bottle of wine, a good Cabernet Sauvignon, filled up her glass, and waited.

An hour later I said brightly, "Does Prince Charles have a nice garden?" Rosemary perked up. I thought, *Here it comes!* She talked about the garden, about trudging about in cold weather and working hard, about lunches alfresco, about the little princes—William and Harry—and how they stole her shoes once. But she never *really* said anything about the Prince. Rosemary is British.

I've never known her to go to any garden, or for that matter, any *place*, that she didn't find something of value, something to get involved in or excited about. Once when she came into my office downtown, one of the women had received a bouquet of roses that had flopped. Rosemary disappeared with them. We found her in the coffee room, sleeves rolled up, soaking the roses in hot water to revive them.

But my favorite memory of Rosemary Verey was made the first day I met her. She and my son Willie, who was five at the time, formed an instant bond. They strolled around the garden like two long-time chums. And after lunch, as we were leaving Barnsley House, she extended her hand to him for a shake. He was bashful and looked at the floor as he shook hands and said, "Good-bye." "Now let's do that again," Rosemary told him with a great, warm grin. "But you must look me in the eye. You must always look people in the eye."

I love that memory. It's so consistent with the Rosemary Verey I've grown to know. As in all things, she looks people and life in the eye. With *Polygonum bistorta* 'Superbum', with Kevin Nicolay, about the Prince, and with my son, she had a firm grasp of quality and form, yet was comfortable with the unruliness of nature. She sees the big picture and still she focuses on every detail. She personifies that quote I jotted down. And that's just the way she is. For, after all, Rosemary Verey is a gardener.

Steven R. Lorton, Northwest Editor of *Sunset Magazine*, is a board member of The Arboretum Foundation and liaison to the editorial board of *The Washington Park Arboretum Bulletin*.

Small Bulbs for Winter Bloom

Text by Mary Robson

Photos by Joy Spurr

Definitions of *winter* differ, but the common denominators in the Pacific Northwest may be sodden ground, heavy skies, and ice skimmed across puddles. The intensity and duration of winter is unpredictable; its gloom for gardeners may be profound. But there is solace in winter bulbs, bright companions of early flowering shrubs. *Solace*

Crocus ancyrensis (upper right) and *C. chrysanthus* 'Advance'. Below, *Crocus tomasinianus* form.



carries meaning beyond the commonly understood “comfort, assuage;” in seventeenth century usage it also connoted “delight, refresh, entertain.” So it is in the spirit of their ability to delight and refresh our winter eyes that we welcome the early blooming bulbs.

Seasons change subtly in the Pacific Northwest. The distinction between late fall and early winter is, at best, a gray blurred line. Fall-blooming species crocus sound the first notes of spring throughout November and into December; *Crocus speciosus* blooms in streaked bluish lavender. Late-blooming crocuses and fall cyclamen may persist into December in mild years. **Cyclamen hederifolium* has delicate pink flowers with silver and green marbled leaves following flower; the evergreen leaves complement later snowdrops and crocus. *Crocus sativus*, the saffron crocus, offers pale petals and vivid orange stamens. If you enjoy paella and want to plant saffron crocus in quantity, 4,000 individual flowers will yield one ounce of saffron.

Even as the garden borders lapse into sloppy dormancy, bulb leaves emerge. Crocus tufts like small green brushes, anemone’s lacy leaves, the floppy grape hyacinth foliage, and dabs of narcissus remind us of spring ahead. The first flowers venturing up may be snowdrops, often seen flowering before Christmas or on mild January days. The genus *Galanthus*, named for Greek “milk flower,” carries drooping bells of clearest white with chartreuse markings on the inner lip. Many hybrids of the common snowdrop, **G. nivalis*, exist, though differences between them, at least in photographs, seem minute—matters of plant height and leaf width. You may find *G. elwesii*, larger flowered and taller, or *G. nivalis* ‘Flore Pleno’, double white. Why seek a double form when the clean, spare form of the common snowdrop satisfies as it does?

Snowdrops have been given many affectionate common names, among them “Fair maids of February” and “Candlemas bells,” as they bloom in England close to the Feast of Candlemas on February second.

The snowdrop in purest white arraie
First rears her head on Candlemas Day.
—Elizabeth Lawrence

Like all early winter blooming bulbs, snowdrops demand good drainage and prefer a woodsy, friable soil. They can take shade, especially shade under bare deciduous trees. Over-

collecting from the wild has been a consistent problem with *Galanthus* of all species; though cultivation in commercial settings is increasing, your best source is a friend willing to share a widening clump. Snowdrops, unlike most other bulbs, move well “in the green,” just after flowering and before leaves die. They prefer moist conditions while growing but can take summer dry. Since they transplant so readily in leaf, we gardeners can serve each other and the region by propagating and sharing snowdrops.

A fiercely brilliant yellow, the winter aconite (**Eranthis* sp.) is often pictured with snowdrops, both of them shaking off slushy snow. Garden writers encourage planting winter aconites in “sheets and drifts,” a prescription that is simpler to offer than to follow. The flowers are brass yellow, resemble buttercups (being also in the Ranunculus family), and are set off in bud and flower by a green frill resembling an Elizabethan ruff. Acquiring and establishing healthy bulbs may be difficult. Like snowdrops, *Eranthis* enjoy moving “in the green”; unlike snowdrops, they seem to dislike moving any other way. Fall-bought bulbs may be dead or dried out; soaking for 24 hours hydrates the bulb but won’t revive a dead embryo. In the Pacific Northwest, we may help our chances by recalling that *Eranthis* “is not fond of acid soils . . . below 5.5” (Bryan 1990). Perhaps we need to grow them on the edges of limed vegetable gardens. Elizabeth Lawrence wrote of fall-bought bulbs: “. . . they do not flourish like the ones that Mr. Krippendorf digs in great clumps from the spring woods and sends to me in bloom.” Alas, Mr. Krippendorf is gone, and we will have to rely on each other. Find that friend with the existing *Eranthis*!

Vernal crocuses are easier to locate and establish than either winter aconites or snowdrops; they increase reliably in Northwest soils. Think of crocus as needing sun, sun, sun—plant them where you and your cat like to bask on winter afternoons. Again, assure them of good drainage and good soil tilth. The delicate yellow *Crocus auncyrensis* blooms perhaps earliest. One hybrid is ‘Golden Bunch’; another early one is *C. tomasinianus*, floriferous when naturalized. Again a lover of lime, it “grows on woods and shady hillsides, especially on limestone” (Phillips and Rix 1989).

For most Pacific Northwest gardeners, the accessible and dependable species crocus is *Crocus*

chrysanthus and many of its cultivars. Blooming very early, with flowers larger than other species (but smaller than the late Dutch hybrids), these cultivars offer delight in pots or sunny garden corners. Many were named by E.A. Bowles for birds: 'Snow Bunting' is white opening to yellow stamens; 'Bluebird' resembles one of its parents, *C. biflorus*, with pale lavender-blue flowers; and several are yellow feathered with brown on petal outsides ('Advance', 'Goldilocks', 'Gypsy Girl', and 'Zwaneberg Bronze'). Closed in rain to protect pollen, open in sun, crocuses tuck in neatly on rockeries, against the edges of walkways, in pots.

Iris—that immense, diverse family—offers winter-blooming bulbous iris, many fragrant. **Iris danfordiae* opens in early winter, a yellow miniature nearly flush with the surface of the ground, as if not wanting to stick its neck up into the cold. This 4" delight may not last long, as it is tasty to slugs and "difficult to keep going in the open garden" (Phillips and Rix 1989). More long lasting and, perhaps, even lovelier is **I. reticulata* with dark petals marked in yellow. Cultivars include 'Cantab', 'Harmony', and 'J.S. Pyk'. It combines nicely with *Crocus chrysanthus* 'E.A. Bowles', a clear yellow.

As the depths of winter recede, early *Narcissus* and *Chionodoxa* appear. *Narcissus* originated across Europe, and different species have different cultural requirements. One of the early dwarfs, *N. cyclamineus*, with petals blown straight back off the trumpet, appears to have been caught in a strong wind. Native to riverbanks, this one will thrive in a damper, shadier spot than many small bulbs. *N. bulbocodium* 'Hoop Petticoat' swells from a tiny waist at the calyx to an open hoop, in soft yellow or creamy white. Late winter offers many narcissus hybrids—'February Gold', 'February Silver', and 'Tête à Tête' among the earliest. 'February Gold', a cultivar of *N. cyclamineus*, has slightly swept-back petals, but its primary impact is the sturdy trumpet and hardness. 'Tête à Tête', hybridized in 1949, opens two strong solid little flowers per stem. Dwarf narcissus, with the necessary good drainage, may be long-lasting in Northwest gardens, settling happily into rockeries and shrub edges. All of these early bulbs can get mud splashed, rain spotted, or chewed up by early slug marauders. Plant them where some shelter is available, and increase your slug vigilance.

Many of these earliest flowers cheer winter



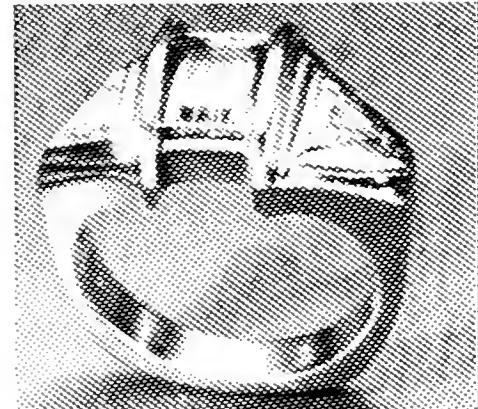
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with bright color, and either faint or pronounced fragrances. The winter garden is like the sparsely furnished teahouse with one flower at the altar: We stand in thin sunshine worshipping one snowdrop, two narcissus. Winter slips away as imperceptibly as it came. The varied thrush song disappears, the snowdrops wilt, and tall narcissus and early tulips stride forward. We've been given, in winter, a meditative beauty to hold before we are overcome by the myriad voices of spring.

Mary Robson works for Washington State University/King County Cooperative Extension as Master Gardener Coordinator. She is on the boards of The Arboretum Foundation and the *Bulletin*.

Joy Spurr's photographs of plants can be seen in textbooks and other publications around the world. She is a member of Unit 81 of The Arboretum Foundation.

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Understanding Winter Cold Damage

by Ray Maleike

Plants in the Pacific Northwest may suffer winter injury from very cold temperatures or from other events related to winter weather. Winter injury can be caused by a complex combination of occurrences, rather than a single factor, and the severity of injury may vary. If one understands how hardiness develops in plants, then action may be taken. It also may explain how a particular plant species may freeze out at +10° F in one locality and be perfectly hardy at 0° F in another place that is fairly close.

Predictions about the type and extent of damage are sometimes difficult to make in the Pacific Northwest because of the differing climates and microclimates. Temperature patterns will vary with change in altitude, being more moderate at lower elevations. Climate also is more moderate in close proximity to a large body of water such as Lake Washington or Puget Sound in western Washington.

Native plants within any geographical area have evolved into the environmental system of that area. These systems include extremes in hot/cold, wet/dry, sun/shade, summer/winter rains, pH, altitude, day length, and other factors. Over many centuries, weaker plants that do not tolerate the environmental extremes have disappeared, leaving the stronger, more tolerant ones to reproduce. These plants are geared into the environmental cues for their particular geographical area. Native plants in a given locale generally do not have problems with extremes—except for those one-in-a-hundred-year winters or those one-in-a-hundred-year droughts.

Exotic plants transplanted to a new area may not be able to adapt well to their new surroundings if the conditions such as day length and other environmental phenomena are vastly different from their native area. Examples of problems stemming from the conflict between ecological range versus physiological range are the flowering dogwood (**Cornus florida*) and blackgum or tupelo (**Nyssa sylvatica*). Both of these plants have a natural geographical range from southern

New England to central Florida, and from the Atlantic Ocean west to eastern Texas and Oklahoma. Although each of these is the same genus and species throughout its range, many ecotypes exist. This means that the plants of either species from central Florida (27° N lat) are geared into different environmental conditions and cues than those from the Hudson Valley, New York (43° N lat). The plants from the southern end of the range will start to grow earlier in the spring, grow later into the fall, and be genetically less hardy in the winter. Either of these plants do well in western Washington but may suffer east of the Cascades if they are progeny of plants from the southern end of the range. Western Washington, with its limited native taxa, relies heavily on exotic plant materials for general landscape use, but sometimes reliance also leads to problems.

Hardiness

Hardiness develops in an organized, synchronous pattern. Shorter days—actually, longer nights—signal the plant that winter is coming. Physiological and hormonal changes within the plant start to prepare it for winter. The shortened days plus cooling temperatures cause the plant to become hardier with time. This is acclimation to cold or hardening. Without cooling fall temperatures, the acclimation process either does not occur or proceeds very slowly.

The hardening process continues until the plant has reached its ultimate mid-winter hardiness, which is genetically controlled. The ultimate mid-winter hardiness of a Scotch pine (**Pinus sylvestris*) from Finland is going to be greater than of one from the Pyrenees Mountains.

When temperatures start to warm up in late winter or early spring, the plant responds by *deacclimating* or *dehardening*. A series of warm days in February may cause plants to deacclimate or become less hardy rapidly. A sudden freeze at this point can damage a plant. When the plant begins to grow in the spring, the new growth usually will tolerate little, if any, frost without damage. As the spring progresses to summer and fall, the days start to get short and the hardiness cycle begins again.

Unusual Stresses

Every so often, abnormal weather or short-term climate conditions occur. These are those one-in-fifty, or one-in-a-hundred-year cold snaps, droughts, or rainy periods. Since 1981, depending on the location in the Pacific Northwest, there



Berberis darwinii's susceptibility to freeze damage can vary within a small geographic area.

have been three or four 100-year cold periods—at least it seems like it. All the freezes have done significant damage to plants and almost all have differed from each other.

Plant damage during cold periods such as December 1990 may occur in a number of different ways. During a warm autumn, with little acclimation taking place, severe cold periods can damage many plants. This is what happened in November 1985. Many of the plants that were slow to acclimate were killed to the ground, including species in such genera as **Escallonia*, **Cistus* (rock roses), **Raphiolepis*, some **Rhododendron*, and other plants. Few native plants were injured. There is little that can be done in this situation, except to cover the plants and hope to trap some heat from the soil.

Extreme cold happened in the third week of December 1983 (-9° F at Washington State

University, Research and Extension Center, Puyallup where normal minimum temperature is + 10° F). Seattle and the Washington Park Arboretum stayed slightly warmer during that period. Plants that were killed to the ground included those mentioned above, some of the more tender **Pyracantha*, and English or cherry laurel (**Prunus laurocerasus*). Little could have been done to protect these plants, although a cover may have helped.

The intense cold of February 1989 did a tremendous amount of damage in the generally milder parts of King County, Washington. The damage was caused by a warm period at the end of January, probably causing some deacclimation followed by the deep freeze beginning February 1. Certain evergreens such as **Berberis darwinii* were killed to the ground in relatively mild Kent, Washington (+ 10° F) and were unscathed at a higher elevation in Auburn, Washington, at 0° F. Because the temperatures were generally colder at the Auburn location, the plants probably had not deacclimated as much as the Kent or Seattle plants had.

The freeze of December 1990 also was a period of intense cold following a warm autumn with no sufficient acclimating period leading up to cold weather. Damage to plants was very extensive. Plants that survived the February 1989 freeze in King County were severely injured or killed in

Glossary

Ecotype refers to a group of individuals of a species that are adapted to a particular environment (Hitchcock and Cronquist 1973).

Taxa (singular, **taxon**) are ranks—such as genus, species, variety, etc.—in the formal system of scientific classification of flora or fauna.



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December 1990. With both of these freezes, there was little that could have been done.

Another type of damage associated with the cold is sun scald to leaves and stems or trunks. Any intense cold period in the Pacific Northwest is almost always accompanied by bright sunshine. The sun can heat evergreen leaves and bark well above the daytime ambient air temperature, which on clear days is usually well below freezing. When the sun goes down, the tissue in the leaves freezes rapidly, causing ice crystals to form, puncturing and killing leaf or stem tissues. The plant damage is caused on the south and southwest parts of the plant. This winter injury may be diminished by shading the plant during the sunlit hours. Consider wrapping trunks of thin-barked trees with a light-colored material for at least one growing season.

Roots are usually never as hardy as the above-ground plant parts. Stems of saucer magnolia (**Magnolia soulangiana*) can, with proper acclimation, tolerate temperatures of -25 to -30° F, but their young roots may be killed at 24 to 25° F. *Cotoneasters, some *dogwoods, and *hollyies also have relatively tender roots. Plants in the

ground generally do not have many problems because soil retains a certain amount of heat. However, the temperature of plant roots in a container—out of the ground—may approach air temperature. This could easily kill the roots of all but the most hardy plants. When plant roots die from freezing, but the top does not, the plant may begin to leaf out in the spring and then die for no apparent reason. To avoid freezing of roots, bring the containerized plant into a cool but moderated temperature, such as a garage, or bury the pot in the ground with a good mulch over the root system. If the plant is kept inside, the plants might still need a certain amount of chill to break dormancy so they can grow again in the spring.

Late spring frost might also injure plants that have a tendency to flush early in the spring. Plants in this category are early blooming rhododendron cultivars such as *'PJM' and *'Christmas Cheer', Higan cherries (**Prunus subhirtella* cvs), Fraser's photinia (**Photinia x fraseri*), and others. This type of problem may sometimes be avoided by covering the plant, or allowing a sprinkler to sprinkle the plant all night long. If the plant is to be sprinkled, the air temperature should not be below 27° F, and the sprinkler should be left on until the air temperature is well above freezing. Sprinkling new growth during light frosts is commonly done in commercial apple orchards.

If a particular plant seems to receive winter damage regularly, it may be wise to replace it with a hardier cultivar or devise some system to put the plant in a moderated climate each winter.

Plants develop hardiness in accordance with the genetic background and the developing weather patterns for a particular season. We can help them by making sure they get into the winter season in the healthiest state possible. This means to make sure they are under good nutrition, not starved or over fertilized; under good water relations, not drought stressed; and without any serious disease or insect stresses. Healthier plants are hardier.

Dr. Ray Maleike is extension horticulturist with Washington State University, Puyallup.

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Witch Hazel Winters

by Timothy Hohn

On a crisp fall day in 1975 I traced my way through the wolverine woodlands of Metropolitan State Park, just outside Detroit, with my requisite pint of cider and greasy bag of fresh baked doughnuts. I was scouting for a pristine, secluded picnic spot.

On a moist woodland bank, covered with a tinted collage of fallen red maple, hickory, and oak leaves, my nose was piqued with the subtle aroma of sweetly scented soap. At first I saw no possible source for such a fragrance—understandable, it being fall and no flowers to be seen. My suspicions were drawn to a rather neat thicket of multiple-stemmed, large shrubs with golden foliage. Upon closer inspection, the fragrance became more intense and—Aha!—peeking out beneath the cloak of glowing leaves were some very bizarre looking *flowers*, of all things! I marveled at the seasonal paradox of the yellow, whimsical flowers of the eastern witch hazel, *Hamamelis virginiana*. The cider was especially sweet that day.

Since that cider-fueled discovery nearly two decades ago, witch hazels have had a fixed place on my list of favorite, temperate garden plants. The phenological paradox among eastern witch hazels of autumn flowers with ripening fruit is expressed in the generic name given to these plants: *Hamamelis* (together with) and *melis* (the apple). I have yet to try divining for water with its twigs, but the common name *witch hazel* belies a utility to this task. Little did I know at the time of my autumn discovery that our native eastern witch hazel is perhaps the most benign garden plant of the genus. Learning later that they are also members of a fascinating parallel flora of glacial refugees distributed in eastern North America and east Asia only added botanical admiration to an already burgeoning horticultural interest.

Pacing carefully around that golden wood of Michigan witch hazels long ago, I rewarded myself time and again with a closer gaze at the dainty, arachnoid flowers and the clear yellow foliage concealing them. Unbeknownst to me, and with a slight leap forward two to three months in

the calendar year, this scene could easily have been repeated in the hill country of Japan or central China—perhaps without the cider and doughnuts! Witch hazels are clanishly consistent about their living quarters. So although the Asian and American species are found widely separated, their woodland habitats are remarkably similar.

Unfortunately, for a rather small genus, there remains some uncertainty about whether it consists of five species or only four. For simplicity's sake, and due to the fact that the questionable fifth species is exceedingly uncommon, let's consider the four species that we're sure about: They are **Hamamelis virginiana*, **H. vernalis*, **H. mollis*, and **H. japonica*. Many authorities consider the questionable fifth species, **H. macrophylla*, to be a southern form of *H. virginiana*. In those cultivated settings where *H. japonica* and *H. mollis* are grown together, they hybridize with some spectacular results. The progeny of this hybridization are included under the name *H. x intermedia* with selected clones being registered under specific cultivar names. These selected hybrids are particularly good garden plants and I shall review them later.

As a small group, it's easy to generalize about witch hazels. For one thing, they are all perfectly hardy garden plants in the Puget Sound region, with representatives from all species in the Washington Park Arboretum. I tend to categorize them as small, multiple-trunked trees, although *H. vernalis* and some of its selections scarcely rise above the stature of shrubs. Their vase shape is very reminiscent of hazelnuts, as are their orbicular, asymmetrical deciduous leaves. On the whole, however, this is an insulting comparison, since the genus *Hamamelis* is far more refined in character and ornament than hazelnut (**Corylus* spp.). For the avid nut gobbler, however, the superlatives can be reversed because the woody, two-valved capsule and hard seed of witch hazel makes a poor snack.

Perhaps the singular most interesting feature of

Glossary (after Webster's)

Petiole is a leaf stalk.

Phenology, here, refers to the branch of science dealing with the relations between climate and periodic biological phenomena such as plant flowering.



Hamamelis x intermedia 'Hiltingburg' in October.



Hamamelis x intermedia 'Winter Beauty' in January.



David McDonald

Hamamelis x intermedia 'Diane'.

all the witch hazels is their habit of flowering during the cold season. I'm not referring to minute, lifeless little specks only a botanist or curio gardener could love. These are real flowers with bright colors, fragrances, and everything—often in the middle of winter! Flowering times range from mid to late fall for *Hamamelis virginiana*, and through the winter to March for some hybrid cultivars. The flowers vary in size but they all have the appearance of dainty shreds of papier mâché, the limp petals often cast out from the bud in a crinkled and twisted trajectory. They occasionally remind me, clustered along the branches this way and that, of a colorful phalanx of spiders about to descend by their silken threads. Shades of yellow are the predominant colors among the species; the hybrids strike off into the orange and maroon portions of the spectrum.

Witch-hazel leaves are always attached in alternating positions along the branches and have uneven bases where their petioles connect—similar to elm. Although the shapes of their leaves may vary slightly from widest at the base to widest toward the tip, they always have distinctive parallel veins. The leaves of the Chinese species, *H. mollis*, are quite fuzzy and appear soft and flannel-like. Though touted for their interesting flowers, their fall color provides stiff ornamental

competition. Like the flowers, shades of yellow are common and appealing, but some fire up the garden with gold, tangerine, and maroon—sometimes on the same leaf!

Hamamelis virginiana

The eastern witch hazel, *Hamamelis virginiana*, with its uniquely aromatic bark, is a common member of the woodland understory from New England to Michigan and south to the Gulf Coast states. Like most of its brethren, this witch hazel is communal and can usually be found in small groups, colonies, or thickets with their roots firmly anchored in a moist, well-drained organic soil. They share space in New York with *Acer pensylvanicum* and *Kalmia latifolia*, in Michigan with *Ostrya virginiana* and *Carpinus caroliniana*, and are neatly nestled into the Georgia foothills with *Rhododendron minus* and *Oxydendrum arboreum*.

Sometimes reaching 25 to 30' tall and as much wide, *H. virginiana* is the largest of the clan. Unfortunately, it is perhaps the most pedestrian in ornamental value, particularly because the yellow fall foliage hangs on to conceal the mid-to-late autumn yellow flowers. The faint perfume of the flowers, however, thankfully penetrates the leafy curtain. I have seen references to a clone of this species which is purported to drop its leaves early,

exposing the blooms. There is also mention of a variety, *henryae*, said to have small, silvery leaves and strongly fragrant flowers.

Hamamelis vernalis

Our smaller native cousin of the eastern witch hazel is *Hamamelis vernalis*, the vernal witch hazel of the Ozarks. Growing in suckering thickets along creek bottoms, this midwinter bloomer is often only 6 to 10' tall and rarely suckers in cultivation in the Northwest. Open grown plants can become quite wide, often twice their height. The foliage of vernal witch hazel turns a crisp, clear yellow in the fall before dropping. The flowers, like the plant, are the smallest of the group with petals sometimes only 4 to 5 mm long. However, what it lacks in size it makes up for in quantity, hardiness, and color. Flower petals unfurl in January or February in shades from light yellow, orange, copper, and red from flower buds that thickly stud the branches. This warm haze of color is punctuated by a pleasant yet indescribable aroma. It is a popular plant in colder climes than ours, its flower petals curling up in a warm huddle on cold days and rolling out unscathed under balmier conditions. Though this species is another somewhat disappointing native, there are some very interesting selections—not surprising since there is quite a bit of natural variation within *H. vernalis*. My favorite, and one of the more interesting witch hazels for the garden, is *Hamamelis vernalis* 'Purpurea'. The flowers are small but plentiful and of the most unusual color—a sort of Peruvian violet, unlike any others. Unfortunately, I also must report the tenuous nature of this name since I have not yet been able to uncover its origins. The cultivar 'Sandra' was selected at Hillier's nursery in England in 1962 for its plum-purple new growth and collage of fall foliage colors in orange, scarlet, and red. The cultivar 'Lombart's Weeping' is a flat-to-pendulous selection of dubious distinction, since this form is said to occur naturally in the wild. Nevertheless, the form is handsome, particularly when fully clothed with leaves.

Hamamelis mollis

For my money, the Chinese witch hazel, *Hamamelis mollis*, is the most ornamental of the naturally occurring taxa and a very good landscape selection overall. It has cornered the market in yellow: yellow fall foliage and yellow flower color. The leaves and flowers are the largest of the genus, although in stature the Chinese witch

hazel is usually second to our native easterner. Adult plants in the Joseph A. Witt Winter Garden are 20' tall with a gracefully arching, vase shape.

Hamamelis mollis grows in the hillside woodlands of east and west central China as high as 7,000 feet. Ernest Wilson describes it as the commonest of woodland shrubs in western Hupeh Province where it flowers in late March and early April, two to three months behind its cultivated brethren in the Arboretum. When they are out, the flowers can be as large as half dollars with stout, strappy petals and a deliciously powerful scent. Blooms often appear around the first of the year and may last for six weeks, depending on the weather. More than once, my January hopes for spring have been revived with the unmistakable, but indescribable, scent of the Chinese witch hazels in the air—sometimes discernable 100 yards away. There is little to improve upon with the Chinese witch hazel, thus the few good selections that exist barely guild the lily. The most popular clone in Europe and the British Isles is 'Pallida', said to be more thickly flowered, richer of color—a golden yellow—and hardier than the species. Although I don't believe there is any room to improve upon the scent of *H. mollis*, 'Pallida' is equal to it.

Hamamelis japonica

The Japanese witch hazel, *Hamamelis japonica*, is definitely the "poor relative" compared with the more ornamental Chinese species. However, it lends an important genetic component to the various hybrid progeny it produces with *H. mollis*. The Japanese witch hazel is certainly the more slender of the two large Asian species. Its leaves are smaller than that of its Chinese counterpart, with longer petioles and a smooth surface. The flowers of Japanese witch hazel are always later than those of *H. mollis*, appearing in late January and February, and are composed of thinner, crinkled petals. The flowers don't reach the half-dollar size of Chinese witch hazel, but the crinkling does give them a distinct character and unusual aspect. They are always some shade of yellow with a carmine center. Perhaps the most attractive of this species is its variety *Hamamelis japonica* var. *flavopurpurascens*, which often has a pleasantly mottled fall color in shades of yellow, bronze, and red. The flowers are yellow suffused with carmine which intensifies toward the base of each petal.

Hamamelis x intermedia

The cultivated hybrids between the Chinese

and Japanese witch hazels offer a wide variety of delightful garden characteristics—some are the perfect synergy between the two species. These hybrids arose independent of each other at the Arnold Arboretum, Jamaica Plain, Massachusetts; the Botanic Garden in Charlottenlund, Denmark; in the nurseries of Heinrich Bruns in Germany; and especially at the Arboretum Kalmthout, Belgium. The flowers are often quite revealing as to the specific influence of each parent. Of the 15 to 20 named hybrid selections, the flowers can vary in bloom time, size, color, texture, and scent. By “flower texture” I am referring to those visual characteristics determined by petal number per flower and petal thickness, as well as the smooth or crinkled nature of the petals. None of the hybrids is any more fragrant than *Hamamelis mollis*, but they certainly do broaden the color range available.

With these hybrids, the flower colors available within the genus *Hamamelis* cover the hot portion of the spectrum from soft, warming yellows to simmering maroons. The same can happily be said for the cheerful and fiery display of fall foliage colors. With careful selection, it's possible to have a bright display of colors from summer to fall and on through to spring.

A good combination of witch hazels for a long season of winter bloom (60 to 90 days) would be the hybrid cultivars *‘Arnold Promise’, *‘Diane’, *‘Jelena’, *‘Winter Beauty’; *Hamamelis mollis* and **H. vernalis* ‘Purpurea’. The hybrid cultivar ‘Winter Beauty’ would be the first to bloom, sometime close to Christmas, with its yellow-orange flowers and tremendous fragrance. Although its flowers are small, their abundance makes them very noticeable. Close on its heels would come *H. mollis*, and ‘Jelena’ with its coppery flowers. One must be patient with ‘Jelena’ as it is shy about dropping its leaves, which can be intrusive at bloom time. Older plants should overcome this youthful tendency. I include ‘Jelena’ here mainly because it extends the bloom season in the orange color range initiated by ‘Winter Beauty’. ‘Diane’ comes next and it is currently the best of the red- or maroon-colored selections with outstanding deep red-to-maroon fall color, as well. The cultivar ‘Arnold Promise’ and *H. vernalis* ‘Purpurea’ come last in February and make a striking color combination in light yellow and violet. Keep in mind that the blooming period and timing will vary, depending on the prevailing

weather conditions. This combination of plants will provide a long and overlapping bloom period with the greatest intensity probably occurring in January. For recommendations of some of the more useful species, species cultivars, and hybrid cultivars, see the shaded list (page 20) accompanying this article.

Cultivation

Witch hazels are best planted in a well-drained, moisture-retentive soil in partial shade, in keeping with the conditions under which they are found in the wild. However, in the Pacific Northwest they will tolerate full sun if they are provided with supplemental irrigation. When siting new plants, consider locations with dark, coniferous backgrounds for suitable contrast with the delicate flowers. As an alternative, place witch hazels where soft winter rays will backlight the translucent petals, thereby magnifying their intensity. This works particularly well with the darker color forms that appear paler in shade or flat light. Don't forget to position the fragrant selections close to pathways or in the path of gentle breezes headed toward unsuspecting noses. Witch hazels also are good overstory companions for rhododendrons and their relatives, mixed with winter bulbs. They are generally free of pests and diseases in the Pacific Northwest and, if sited correctly, require little on-going maintenance. One cautionary note: the hybrid cultivars are often grafted and one should be diligent about removing any understock suckers that may appear.

Witch hazels are versatile landscape plants suitable as specimens for the small backyard or in striking masses for commercial or institutional grounds. One plant of Chinese witch hazel can brighten the dreariest of winter yards. On a larger scale, imagine a planting of four dark green Nordmann firs (**Abies nordmanniana*), fronted with a half dozen witch-hazel selections perfuming the atmosphere and representing the full range of seasonal colors in yellow, copper, and maroon.

Timothy C. Hohn is Curator of Living Collections, Washington Park Arboretum and University of Washington Center for Urban Horticulture.

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Witch Hazel Recommendations and Viewing Locations

The following are recommended selections of witch hazel based on the performance of a limited number and range of plants at the Washington Park Arboretum and the Boskoop Experimental Station, The Netherlands. Obtain a map of collections at the Graham Visitors Center. Request propagations at the nearby Pat Calvert Greenhouse, 10-12, Tuesdays.

H. x intermedia cultivars

* 'Arnold Promise': flowers are large, light yellow, and fragrant in late February; fall color mottled yellow, orange, red. (Hamamelis Collection).

'Barmstedt Gold': flowers very large, deep golden yellow, and with a slight fragrance in early February.

* 'Diane': flowers are medium, carmine red in January to February; fall color crimson. (Winter Garden and Hamamelis Collection).

* 'Jelena': flowers are large, coppery orange in early January, extending the orange color season begun with 'Winter Beauty'. (Winter Garden).

* 'Primavera': flowers large, canary yellow in January and February. (Hamamelis Collection).

'Westerstedt': flowers are large, canary yellow in late February, slight fragrance.

* 'Winter Beauty': flowers are small, abundant, yellow-orange in December to January; very fragrant. (Winter Garden).

Hamamelis mollis

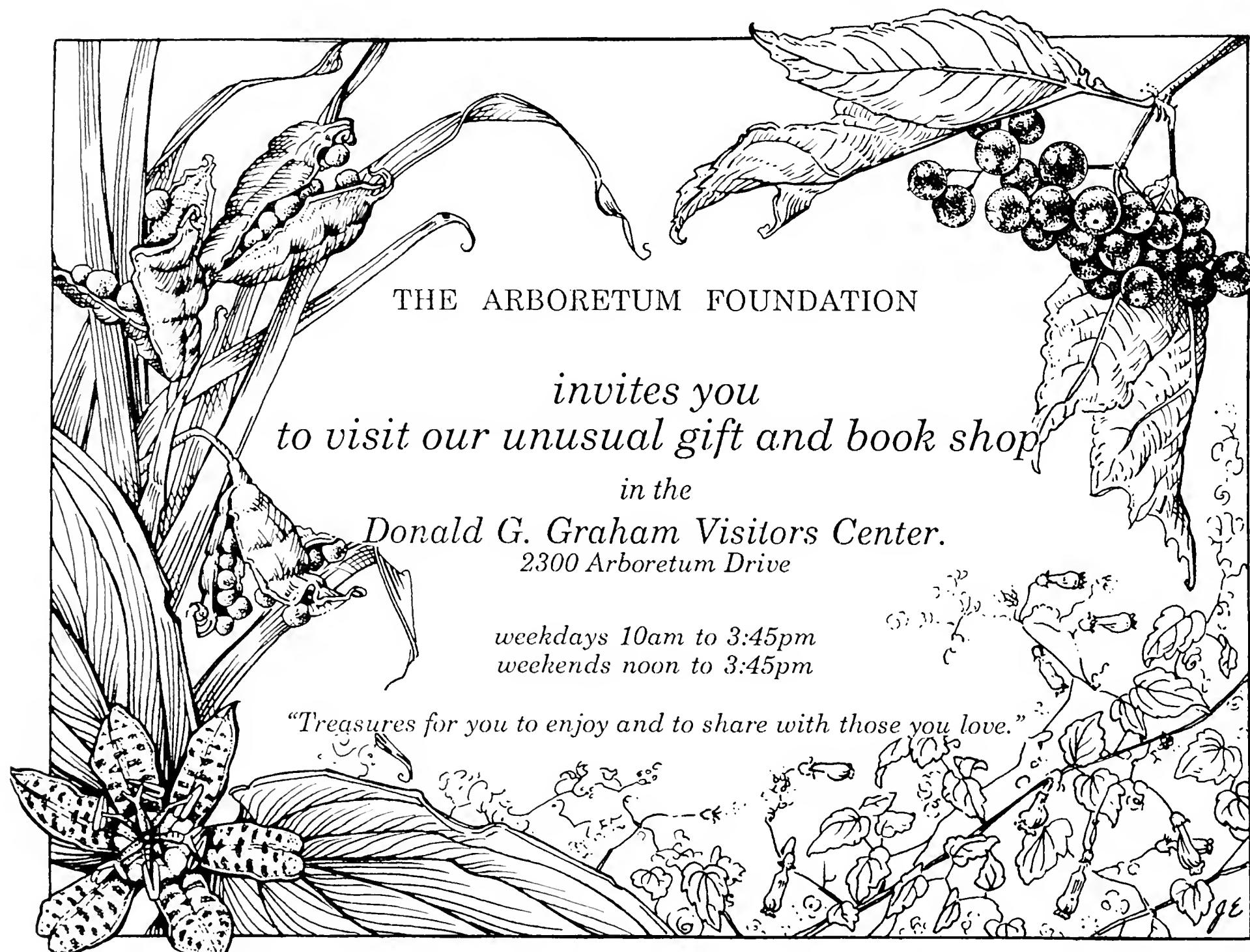
* *H. mollis*: flowers are large, golden yellow, very fragrant in early January; fall color yellow. (Winter Garden and Hamamelis Collection).

* *H. mollis* 'Pallida': flowers are large, light yellow, very fragrant in January; fall color yellow. (Winter Garden).

Hamamelis vernalis

* *H. vernalis* 'Purpurea': flowers are medium to small, striking violet color. (Hamamelis Collection).

H. vernalis 'Sandra': foliage color plant has outstanding, mottled autumn colors of yellow, orange, and scarlet; new spring growth is tinged purple.



Protecting Your Trees with Dormant Oils

by Arthur L. Antonelli

This often overlooked alternative to conventional pesticides is used to control some Pacific Northwest pests.

It is a time of rising concern about ways in which conventional pesticides adversely affect organisms surrounding their target plants, as well as ecosystems in general. Consultants, landscapers, and gardeners must look for and concentrate on the effective use of bio-benign alternatives, limited though they may be.

We can identify only a few examples of such alternatives for pest control. These include: formulations containing insecticidal bacteria (e.g., *Bacillus thuringiensis*), soap insecticides, abrasives, borates, growth regulators, botanicals, and high-grade horticultural oils.

As an alternative pesticide, the horticultural oils seem to be continuously overlooked, possibly because of the fear that they might injure plant leaves (phytotoxicity). This fear may have been warranted in past decades, but modern spray oils have come a long way in refinement (Capizzi et al. 1982). As a testimonial to renewed interest in oils, one only has to go to the scientific literature and observe many of the recent reviews or experimental work involving oils and landscape plants (Capizzi et al. 1982; Johnson 1985; Baxendale and Johnson 1988 a, b; Miller 1989; Grossman 1990). Oils today are far safer to plants than were their progenitors. Indeed, with some care in choice of material and application, many plants can be sprayed during the dormant or delayed dormant period with no concern for harm to the plant. In many cases, this also includes oils applied in the summer.

How Safe are Spray Oils?

Used according to label instructions, horticultural oil poses no threat to human beings or pets. Short of taking a bath in them or swallowing copious amounts, oils are among the safest of pesticides.

The real question is how safe horticultural oils are to plants. There are two ways of answering

Arthur L. Antonelli



Cottony camellia scale on yew. This species attacks holly as well as camellia and yew.

this question. First, authorities (Baxendale and Johnson 1988a; Miller 1989) document responses of specific plants for both dormant and summer oils. Warren T. Johnson, a leader in the field of horticultural oil research, has not found any published work demonstrating phytotoxicity to any species of deciduous tree or shrub in the United States from the use of high-grade horticultural oil applied during the dormant stage (Johnson 1980). Indeed, I've found that the same is true for many conifers. However, there are indications that oils are sometimes phytotoxic to some junipers. Also, the classic response of Colorado blue spruce to oils is the loss of its bluish hue following application.

The second way to deal with the question of safety is to simply abide by the label itself. Use the

Glossary

Bio-benign indicates an action or substance not harmful to plants or non-target animals.

Borates are a salt or ester of boric acid.

Dormancy is a period of inactivity in plants.

Delayed dormancy is the period just before physiological activity begins in plants.

Overwintering is the stage and condition in which insects spend the winter.

Phytotoxicity is the eliciting of a toxic reaction in plants. The condition occurs when foreign materials (e.g., chemicals) cause an adverse reaction such as burning, stunting, etc.

oil only on the plants listed and pay special attention to lists indicating certain plants to which it is toxic. Mix according to instructions. Also, avoid applying dormant or delayed dormant oils in temperatures below 40° F or when temperatures might approach freezing soon after application; this may cause injury to the plant. The label can determine the specifications for superior oils.

Unfortunately, no horticultural oil label provides a total picture of what is actually in the container. Theoretically, some indication of unsulfonated residue (UR), gravity, viscosity, distillation range, and pour point should be on the label. At the very least, the UR rating must appear on the label that is intended for use. The UR (unsulfonated residue) rating is an index of the amount of the product free from unsaturated hydrocarbons. Injury to plant leaves is related to the percentage of unsaturated hydrocarbons in an oil. An oil with a UR of 92 percent or more is considered safe on green plant leaves (Capizzi et al. 1982).

According to Warren Johnson (1980), factors that cause phytotoxicity are:

1. overdose;
2. wrong timing of spray
 - a. don't spray when buds have fully opened and shoot elongation is occurring.
 - b. don't spray when there is an obvious moisture deficit observed in leaves.
 - c. don't spray sensitive plants when the relative humidity is expected to remain over 90

percent for a period of 48 hours;

3. mistaken dormancy (fall); and
4. genetic variability.

Writes Johnson: "Should phytotoxicity occur, the user failed to account for one or more of these factors. The extent to which genetic variability occurs is not known."

Another question is about the impact of oil sprays on beneficial insects. Oils are not selective as to what eggs or other life forms they kill. For example, the valuable eggs of overwintering predators also can be killed while applying oil to the eggs of pest species. The "up side" of this is that oils are short-term-contact insecticides that kill only organisms immediately covered by the oils (Grossman 1990). Any subsequent movement of beneficial organisms into the area is not affected and survival is assured.

How Dormant Oil Kills Pests

Researchers believe that oils prevent or impair pest survival in three ways (Willett and Westigard 1988). First, oils interfere with the ability of the pest to obtain oxygen by plugging air-exchange apparatuses, causing suffocation of insect and mite eggs. It is important to note that eggs are more vulnerable when winter is ending and hatching is near. This reflects many consultants' recommendations that applications during delayed dormancy are more effective against eggs than are dormant applications, since the former method more closely coincides with the end of overwintering. A second way in which oils kill pests may be the pene-

Rosy apple aphids on underside of apple leaf. Note the curling distortion. This is caused by toxins associated with feeding when aphids insert their mouth parts. A healthy *Malus* 'Butterball' (left), with orange-yellow fruit.



tration of the pests' cuticle and subsequent interference with nerve transmission. The authors indicate that there are no data, however, to support this speculation. Third, oils act as repellants to pests as well as killing them outright.

Common Target Pests Susceptible to Oils

In ornamental landscapes in the Pacific Northwest, some of the pests most vulnerable to oil applications during delayed dormancy include a number of aphid species that overwinter on the targeted host as exposed eggs and several scale species that overwinter on targeted hosts in the very vulnerable nymphal stage. Apple aphid (*Aphis pomi*) and rosy apple aphid (*Dysaphis plantaginea*) are two common aphid pests of apple and flowering crab apple (**Malus* spp.). The apple aphid causes wilt in growing tips and can stunt growth, whereas the rosy apple aphid causes extreme leaf distortion that can extend to fruit distortion and stunting, as well. Both overwinter as eggs on twigs and spurs of their hosts. Leaf-curl plum aphid (*Anuraphis helichrysi*) and black cherry aphid (*Myzus cerasi*) cause severe distortion to the leaves of flowering plum and flowering cherry (*Prunus* spp.). Additionally, their excretions lead to the build-up of unsightly sooty mold. These aphids also overwinter as eggs on the targeted host and as such are vulnerable to delayed dormant oil. Two common scales that overwinter on their hosts as vulnerable nymphs are the Lecanium scale (*Lecanium* spp.) and the brown soft scale (*Coccus hesperidum*). The Lecanium scale has hundreds of host plants ranging from blueberry (**Vaccinium corymbosum*), to many of the flowering **Prunus* species. The brown soft scale also has many hosts that include dogwood (**Cornus* spp.) and many other favorite landscape plants.

Additional species that overwinter on known hosts as vulnerable nymphs include: San Jose scale (*Quadraspidiotus perniciosus*), cottony camellia scale (*Pulvinaria floccifera*), azalea bark scale (*Eriococcus azalea*), and cottony maple scale (*Pulvinaria innumerabilis*).

Without a doubt, a properly applied delayed dormant oil spray will do a good job of controlling most overwintering populations of these scale or aphid pest species. However, you are limited by the legality of the product, so read the labels on the containers. Even with this limitation, delayed dormant oils are a useful alternative to conventional pesticides when they can be used legally and effectively. Additionally, as more and more

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research in our area reveals safe and effective control of certain summer stages of pests, we will see more recommendations for use of oil in summer by professional plant care consultants.

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Suggested Reading

See also "Northwest Hort Review: Integrated Pest Management for Residential Landscapes," by Van M. Bobbitt in the winter 1990 *Washington Park Arboretum Bulletin* 53(4).

Arthur L. Antonelli, Ph.D., is an extension entomologist with Washington State University at Puyallup, Washington.

Flowering Rhododendron Species from December through March

by Kelly Dodson



Rhododendron strigillosum

We are well acquainted in the Seattle area with the travails of gardening in winter. The rain and pervasive gray sky tend to relegate many gardeners to an armchair with a stack of catalogs. The occasional bunch of crocus or galanthus coupled with witch hazel are a respite to the plodding dreariness, but they often do little more than whet the appetites of anxious gardeners. To fill out the late winter and early spring floral

ranks, rhododendron species are a surprising choice to many.

Rhododendron is an extremely variable genus ranging from the tropics of Indonesia to the arctic tundra, and encompassing prostrate alpine creepers to towering forest giants in the Himalayan foothills. Considering such diversity, it is hardly surprising that there are rhododendrons that bloom much earlier than the expected late spring

hybrid extravaganza.

Perhaps the earliest to flower and an excellent example of diversity within a species is the variable **Rhododendron dauricum* and early blooming clones such as 'Midwinter', which often begin flowering in late December. This species can be a deciduous, semi-deciduous or nearly evergreen twiggy shrub ranging from dwarf forms found around Lake Baikal (Russia), to open vertical plants of 10 feet or more in height. The flowers run the gamut from purple shades through almost pink, to pure white. Nearly every branch terminates in a flower cluster. The overall effect is particularly nice when viewed against a backdrop of evergreen plants. On those forms with persistent foliage, winter brings a pleasing purplish bronzing to the leaves. A fine white flower selection is the February blooming 'Hokkaido'.

**Rhododendron mucronulatum* is a closely related deciduous species of very similar appearance. One of its taxonomic differences is the mucronate or pointed leaves from which the name is derived. It inhabits the same geographic range as *R. dauricum* but with a more easterly shift. Again, we have a variable shrub of dwarf-to-tall stature that is thin twigged and of fine texture. The flowers are very close to *R. dauricum* in colors and appearance. Notable cultivars include the very early 'Winter Brightness' whose lavender-pink flowers are not uncommonly held aloft amidst falling snow. 'Cornell Pink' is a popular form with gentle pink flowers blooming a bit later. It is appropriately planted in a drift in the Joseph A. Witt Winter Garden. Also blooming later is a Japanese selection, 'Mahogany Red' whose darkly pigmented flowers are aptly described in its name. *Rhododendron* enthusiast Warren Berg, who lives on the Olympic Peninsula, has introduced a number of superb dwarf selections he collected on high elevations of Cheju Island, Korea. These precocious March bloomers are a natural choice for the rock garden and are best grown lean to accentuate their compact habit. Mature plants of *R. mucronulatum* in its more typical form can be found at the head of Azalea Way across from the Graham Visitors Center.

Another February standout is **Rhododendron moupinense*. This generally open growing plant seldom exceeds three feet in height and is often found as an epiphyte in its native home of western Sichuan Province of China. Its characteristic of growing on trees and rocks is a clue that it is a

fairly drought-tolerant plant that demands drainage and aeration. An interesting way to display *R. moupinense* and to satisfy its requirements would be to plant it in a decaying log or stump. The flowers, white-tinged pink to rose, seem large for a plant of such small scale. They occur singly, in pairs, or in three per truss, and can be damaged by frost; most often, however, they escape without damage in the Pacific Northwest. *Rhododendron moupinense* is an introduction of E.H. Wilson, the plant explorer, and is named for an area in Sichuan formerly known as Moupin.

Rhododendron moupinense has a relative paucity of flowers, but **R. lanigerum* has flowers to spare. The cultivar 'Chapel Wood' packs up to 50 rose-colored flowers in its trusses, whereas other forms have as few as 25. The resulting inflorescence is remarkable in its spherical shape and is a rather startling sight in February and March when one expects something a bit more restrained than this floral abandon. *Rhododendron lanigerum* was first introduced by plant explorer Frank Kingdon-Ward from a 1928 collection in Assam, a northeastern Indian state in the Himalayan foothills. This species has several award-winning forms such as 'Silvia', with flowers of pink-crimson flushed white, and 'Round Wood', which blooms later with crimson flowers. *Rhododendron lanigerum* KW 8251 is a selection which is typically the first to show color with its rose-pink flowers. A prelude to these extraordinary flowers are the huge flower buds that are decorative in their own right and merit examination in all stages of development. The foliage also is attractive with the leaves being up to 9" long, clad in tomentum when young, then retaining a soft indumentum when mature. The drawback to *R. lanigerum* is that it must be considered marginally hardy. Our average winter will cause it no problems, but severe winters such as we have experienced in recent years will cause damage to the extent that it is no longer a viable garden plant. However, it is worth trying in a favorable micro-climate or when providing physical protection, for the memory of a few good years of bloom will endure long after it has succumbed to yet another 100-year winter.

From Mt. Omei comes the much hardier and equally exceptional **Rhododendron strigillosum*. Named for the short strigose bristles cloaking branchlets and petioles, *R. strigillosum* is a distinctive foliage plant with the added boon of

Glossary

Epiphytes derive their moisture and nutrition from the air and rain, and usually grow on another plant.

Indumentum is the hairy covering found on the underside of a leaf, varying in color and texture.

Inflorescence is the flower cluster of a plant.

Petiole is the stalk of a leaf.

Strigose indicates sharp, stiff bristles.

Tomentum is a covering composed of matted, woolly hairs produced on new foliage.

Truss is a flower cluster.

lovely scarlet flowers appearing in late February and early March. With eight to 12 flowers per truss, the inflorescence is lax and flat topped, but not to its detriment. Becoming a rounded shrub to 10 feet in the open, it thrives in a woodland setting, and the resultant open habit is very comely. A large plant has few rivals in bloom; see it in the Joseph A. Witt Winter Garden.

One of those few rivals is **Rhododendron barbatum* with compact saturated red trusses in February and March. *Rhododendron barbatum* is a very open growing shrub or small tree with smooth reddish-brown-to-purple bark that is reminiscent of **Arbutus unedo* or shrubby **Arctostaphylos* spp. A handsome plant with bold foliage, some forms also have vividly colored bud scales that create a second “flowering” as the new growth elongates. Less hardy than *R. strigillosum*, *R. barbatum* was damaged in last winter’s record cold as evidenced by the plants in the Witt Winter Garden. Selections from within its natural range in high elevations should be grown when possible.

The tiny-leaved *Rhododendron parvifolium* is a superb species for the rock garden. Though it is closely allied to the irascible *R. lapponicum*, it does not have *R. lapponicum*’s quirky disposition and is much more amenable to garden cultivation. The good drainage and exposure inherent to rock gardens is well suited to *R. parvifolium*. It inhabits much the same regions as *R. dauricum*, but also extends into Alaska. Although generally rare in cultivation, it has seen some commercial distribution in recent years. The small rose purple

flowers appear in January and February in abundance and can tolerate a fair amount of frost before damage occurs.

A dependably hardy late winter bloomer is **Rhododendron sutchuenense* with light pink to lavender pink flowers of good substance. Those plants with flowers having a pronounced blotch historically have been known as *R. sutchuenense* var. *geraldii*, which is now regarded as a natural hybrid of *R. sutchuenense* and *R. praevernum*, a similar species. Well-grown mature plants of both types can be seen in a tree-like grove across Arboretum Drive East from the Brian O. Mulligan *Sorbus* Collection and near the top of Rhododendron Glen.

Sharing this grove and also growing just above Loderi Valley is the related **Rhododendron calophytum*. Bold of foliage and stout of limb, this strongly architectural plant forms a large rounded shrub or small tree. The flowers are most often pink, but occasionally white; the pink forms possess the bright-colored bud scales described above for *R. barbatum*. *Rhododendron calophytum* is slower to flower than the more precocious *R. sutchuenense*.

Another species slow to flower is **Rhododendron ririei*. Its lavender flowers do not enjoy the wide acclaim of more flamboyant species, but they bloom in February. Large plants are in the Witt Winter Garden and, like many of the other species mentioned that have been recently planted here, *R. ririei* shows some setback due to transplanting and in coping with last winter.

These are just several species that are at their peak by March. In view of such diversity, it is easy to imagine a winter garden setting where a species *Rhododendron* can be featured.

Kelly Dodson is the co-owner of Reflective Gardens (garden design and implementation) with his wife, Sue Skelly. Kelly is a former horticulturist with the Rhododendron Species Foundation, Federal Way, Washington. He is a new editorial board member of *The Washington Park Arboretum Bulletin*.

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In the Washington Park Arboretum: Winter Damage

by Timothy Hohn

The few redeeming aspects of our recent spate of cold periods are the tremendous shows of bloom by those plants, such as *Syringa* and *Malus*, normally dissatisfied with our mild Puget Sound winters. Also, and more importantly for the Arboretum, is the opportunity to evaluate the hardiness of plants in the face of stressful weather conditions. Let me assure you, however, that this academic attitude is often poor recompense for the disappointing losses we experience during these periods, which we always hope are the last ones.

What makes the severe cold so devastating is that it is not usually preceded by progressively colder periods, such as light frosts followed by hard freezes, which contribute to the acclimation or "hardening off" of plants. Consequently, many of our ornamental plants are "soft" and vulnerable to freezing injury. Plants that would survive such cold spells unscathed in the eastern United States, where they are adequately preconditioned by hot summers and progressively cooler autumn weather, are severely damaged in the Puget Sound region. This phenomenon is unaccounted for in hardiness zone maps and unpredictable for those who rely on them without question.

Before our December 1990 freeze, we experienced nearly balmy conditions at the Arboretum with more than usual moisture, two light frosts, and daytime highs in the 40s and low 50s. Then the express came to town. On December 17, 1990, we had a high of 52° F and a low of 43° F; 24 hours later the mercury stood at 25° F and dropping. Ten inches of heavy, moisture-laden new snow and a bone-chilling 5° F still seemed a fitting first day of winter on December 21. As is often the case during cold spells, the sun shone brightly on limp and curled foliage, too weak to warm the air but adequate to desiccate exposed plants. To add injury to injury—and after a very brief thawing, sufficient to melt the insulating blanket of snow—the mercury was at 10° F for two successive nights, with bright sunshine during the intervening days to complete the scorching begun earlier.

The final outcome of this miserable weather is still being fully assessed at the Arboretum. In fact,

we may not see the final results of the impact on certain plants (e.g., some trees), for another year or more. Cold-stressed plants with no immediately observable signs of cold damage may nevertheless be rendered highly susceptible to secondary pathogens and otherwise benign insect populations. It's amazing to me how long some plants with severe cambial damage can survive on secondary reserves and reduced water uptake until the hot, dry weather hits. It was not uncommon to see plants that looked completely unscathed, such as shrubby species of *Arctostaphylos*, collapse during warm days.

The most severe damage in the Arboretum was sustained by trees that were broken up by excessive snow loads during high winds. Many trees were toppled over by heavy snows, high winds, and spongy or shallow soil conditions. Of the small but diverse collection of southern beeches (*Nothofagus* species), we lost four different species to breakage and wind-throw. The total estimated value of the loss to the Arboretum in tree damage is \$260,000. Fortunately, because we collect and grow more than one of any species or cultivar, total losses were actually few.

Freeze Damage

The most striking results from the storm are the effects on broadleaved evergreens in various types of exposures. For instance, *Maytenus boaria*, a fine-textured small tree from Chile, was frozen to the ground in exposed sites but only slightly defoliated in the shade of larger trees. This phenomenon, caused by physiologic drought, can be observed throughout the Arboretum among several different genera of broadleaved evergreens. A standard precaution against this sort of damage in areas that regularly experience cold, sunny winters is to confine broadleaved evergreens to areas with winter shade.

Some of the freeze damage was hardly surprising, although we did have our fingers crossed. The eucalypts were all killed to the ground but are coming back vigorously. Certain buddleias, evergreen cotoneasters, escallonias, and various rhododendrons in the more tender subgenera and sections were killed to the ground as well. If these plants had been growing vigorously prior to the

storm damage they should spring back from the base; however, weak plants may never recover. Another heartbreaking result of the storm is the damage incurred by some of the large, showy Himalayan magnolias, such as *Magnolia campbellii*. Some of these magnificent trees have been killed back to the central leader and may never attain the mature stature they once had. Our most severely damaged group of conifers was the true cypress (*Cupressus*) species. Some of these appeared as though they had been through a fire, but many are coming back with new growth from the shoot tips. Our Himalayan firs (*Abies spectabilis*) were completely defoliated with some stem dieback; these may not recover.

Some unexpected damage could be found among some genera and species ordinarily thought of as hardy. The mountain ashes (*Sorbus* spp.) suffered dieback in the cases of *S. hupehensis*, *S. vilmorinii*, and *S. megalocarpa*. Certain pines, such as *Pinus wallichiana*, and some junipers were severely burned. The widely sold *Viburnum tinus* was heavily damaged in the Arboretum, whereas certain other Asian evergreen species such as *V. japonicum* and *V. henryi* were hardly blemished—perhaps a phenomenon related to winter shade. Many of the Hinoki false cypress clones (*Chamaecyparis obtusa*) were badly damaged, yet the unknown and handsome *Austrocedrus chilensis* was hardly touched.

Some notable survivals and recoveries include *Eucryphia x intermedia* 'Rostrevor', totally defoliated but recovering with little dieback, while *E. x nymansensis* 'Nymansay' is heavily damaged. Our spectacular Chilean fire tree, *Embothrium coccineum*, a scarlet-flowered gem without peer in the landscape and easy to reproduce from seed, came through the winter with only modest

flower bud blast. Certain evergreen oaks, such as the compact and beautiful *Quercus myrsinifolia* from Japan and *Q. hypoleucoides* from the arid Southwest, performed as usual with nary a blemished leaf. One of our more handsome broad-leaved evergreen trees native to Oregon and California, *Umbellularia californica*, has proved a very hardy subject through our recent cold spells.

Needless to say, as part of the role of the Washington Park Arboretum, it is our business to observe and document the performance of plants in our collection. We shall continue to keep a close eye on the collection to assess potential latent effects of our 1990 freeze. (See also Ray Maleike's article on preparing for winter damage, this issue.)

Please drop me a line at the Washington Park Arboretum or call (206) 543-8800 if you would like specific information about the performance of plants in the collection. Of course, you may obtain any plants mentioned here through the Arboretum Foundation's Pat Calvert Greenhouse, open Tuesdays from 10-12.

Timothy C. Hohn is Curator of Living Collections for the University of Washington's Center for Urban Horticulture and the Washington Park Arboretum.

Glossary

Cambial refers to the cambium, which is the plant tissue responsible for growth in diameter.

Physiologic drought is when an evergreen plant loses more moisture from its leaves than it is able to replace from its roots.

Wind-throw are trees blown over by high winds.

Patricia Pineheart Oswald

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For Further Information

by Valerie Easton

Where Can I Buy...?

You've laid out your garden paths and boundaries on graph paper, specified evergreens for backdrops and screens, and designated perennials in varying heights and colors for the border; you even decided upon a brown turkey fig for that sunny south corner against the wall. Or, you've hired a landscape designer who has specified mass plantings of a *Sarcococca* variety you've never heard of. And now it is time to plant. Where can you find the plants to fit into your landscape? Sometimes finding the desired plant material is the most difficult part of creating a garden.

Instead of wandering from nursery to nursery in search of that specific *Sarcococca*, you can use the wide variety of material available to aid in locating plants locally, nationally, and internationally. There are monthly lists, specialized guides, and large directories listing thousands of different plants that fit your designs and specifications.

A good place to start is *PlantSource*, a monthly regional magazine published in Bellevue, Washington, that lists trees, shrubs, and other herbaceous and woody plants and where they can be found in western nurseries. Most listings include current information on size, quantity, and price of the plants at each nursery. For example, the October 1991 issue tells us that *Sarcococca hookeriana* var. *humilis* is available in both one-gallon and two-gallon cans at two Seattle nurseries in sufficient quantities for a mass planting.

Another regional guide is *Hortus Northwest* which is a new Oregon directory specifically for locating Northwest native plants. It has separate sections on wetland plants, trees and shrubs, perennials, and ground covers, and is especially valuable for locating hard-to-find natives.

When you want to see a picture of what you're ordering and get an idea of costs, size, and quantities available, the best bet is to take a look at a nursery catalog. Many nurseries put out catalogs of their offerings, most often in spring and fall, varying from brief typewritten lists to lavish full-color tomes. The Elisabeth C. Miller Library at the University of Washington Center for Urban

Horticulture has a collection of over 700 catalogs, indexed by plant and source. Included here are the large nurseries like Wayside Gardens and Burpee's, and also many local and national specialty nurseries, such as: Aldrich Berry Farm in Mossyrock, Washington; Green Earth Organics in Everett, Washington; Endangered Species in California; Limerock Ornamental Grasses in Port Matilda, Pennsylvania; and Roadhouse Nursery (aquatic plants) in Poulsbo, Washington.

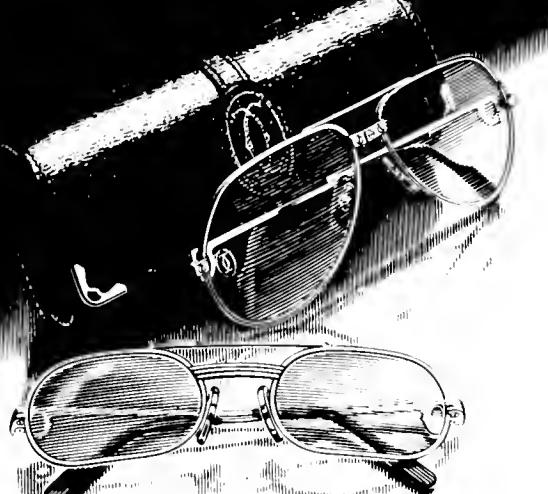
A useful guide to these smaller local nurseries is the *Specialty Nursery Guide*, a free pamphlet issued each spring by Washington State's Specialty Nursery Association. The 1991 edition lists 34 nurseries from Federal Way north to Stanwood and east to Carnation, with specialties ranging from bonsai to kiwi.

There are several excellent national directories that can be used to identify nurseries that carry the plants or seeds you seek. Then you can locate the catalog in the library collection and read more about the nursery, seed, bulb, or plant before calling or writing to place an order.

The Andersen Horticultural Library's Source List of Plants and Seeds, published in 1989, is a computerized listing of over 40,000 trees, shrubs, vines, perennials, herbs, annuals, vegetables, and fruits commercially available in North America. Look up your species or variety by its botanical name, then use the numbers next to it to refer to the nursery listing in the front of the book. To find the botanical name, you can look in the cross references for common names. For example, under "strawberry tree," *Arbutus* will be listed. Turning to the plant listing, you see that the compact type is carried by nurseries 718, 50199, 551164, and 51396. Also listed are the pages in their 1988-89 catalogs where the plant can be found. Turning to the list of nurseries at the front of the book, we see that 718 is ForestFarm in Williams, Oregon, and 50199 is Monrovia Nursery in Azusa, California. The Miller Library has current catalogs from both these nurseries. A new edition of this extensive directory is due out in fall 1992.

Other comprehensive national directories are:

Garden Seed Inventory, which contains all non-hybrid vegetable seed available in the United



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Fruit, Berry and Nut Inventory lists all varieties available by mail order in the United States.

Cornucopia: A Source Book of Edible Plants specifies sources for edibles from almonds to watermelons.

If you are planning a trip to the British Isles, three plant directories are useful. *The Plant Finder*, issued annually and published in association with the Hardy Plant Society, lists over 50,000 plants, including bulbs and fruit, and where to find them in the United Kingdom and Ireland. *The Bernard E. Harkness Seedlist Handbook* lists alpine and rock garden plants offered by the seed exchanges of the major plant societies in America, England, and Scotland. *The Green Pages: A Guide to the Nurseries and Garden Centres of the British Isles* is a descriptive listing by nursery, and also includes a listing by specific plant and type of plant. For example, it tells you which of 23 nurseries carries a good selection of alpine and rock plants, and which two to try if you specifically are looking for *Lewisia*.

Mail order gardening is becoming very popular and two such guides are invaluable: *The Mail Order Gardener* by Hal Morgan and *Gardening by Mail*, 3rd ed., by Barbara Barton. Barton's book includes mail order sources for pest controls, garden furniture and equipment, and other accoutrements, as well as house plants, trees, shrubs, annuals, perennials, and vegetables offered by seed companies and nurseries in the United States and Canada. The listings here are more general than *PlantSource* or *Andersen*. If you're interested in *Iris*, for example, you can find sources for 16 different types, iris societies in Washington State, and books about iris in this comprehensive catalog. Now we have a local guide, the *NW Washington Gardeners' Resource Directory*, by Stephanie Feeney, which gives a good overview of educational and volunteer opportunities in horticulture, resources, nurseries, literature, plant sales, gardens to visit, etc., in the region from Olympia, Washington, to Vancouver, British Columbia.

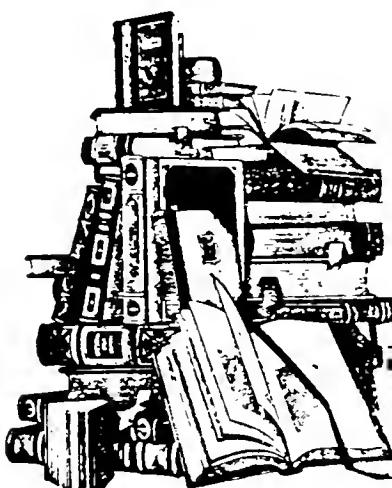
Additional sources for plants and seeds often are found in books on specific subjects. The Brooklyn Botanic Garden quarterly, *Plants & Gardens*, gives sources for plants in all its single topic issues. Special volumes in the last few years have included wild flowers and native plants, and herbs and ornamental grasses, with an issue

devoted to perennial sources (*Perennials: A Nursery Source Manual*, winter 1988/89). A more current source for perennials is *Perennials: Toward Continuous Bloom*, which as a collection of pieces by current garden writers includes sources for their favorite perennials. Other books rich in sources are: *The Combined Rose List 1991*, *Miniature and Dwarf Geraniums*, *Gardening with Native Plants of the Pacific Northwest*, and *Azaleas*. Whenever you're reading a book about a particular kind of plant, check the table of contents to see if there's a source list.

We are fortunate in the Pacific Northwest to have so many good nurseries, but we are by no means restricted to what they carry when we are doing our modern version of plant hunting. We

no longer need to go out into the wilds of China to find special plants, but rather can avail ourselves of the many directories, catalogs, and source books available for locating even the most unusual and scarce. Lest you think I exaggerate, *Andersen Horticultural Library's Source List of Plants and Seeds* lists sources for over a dozen *Stewartia*, 41 kinds of *Hypericum*, over 1100 kinds of *Chrysanthemum*, and more than 2500 kinds of *Hemerocallis*.

Valerie Easton is a librarian at the Northwest's foremost horticultural library, the Elisabeth C. Miller Library, University of Washington Center for Urban Horticulture. She has been the book review editor of the *Bulletin* since 1988.



New on the Shelves of the Elisabeth C. Miller Library

by Valerie Easton

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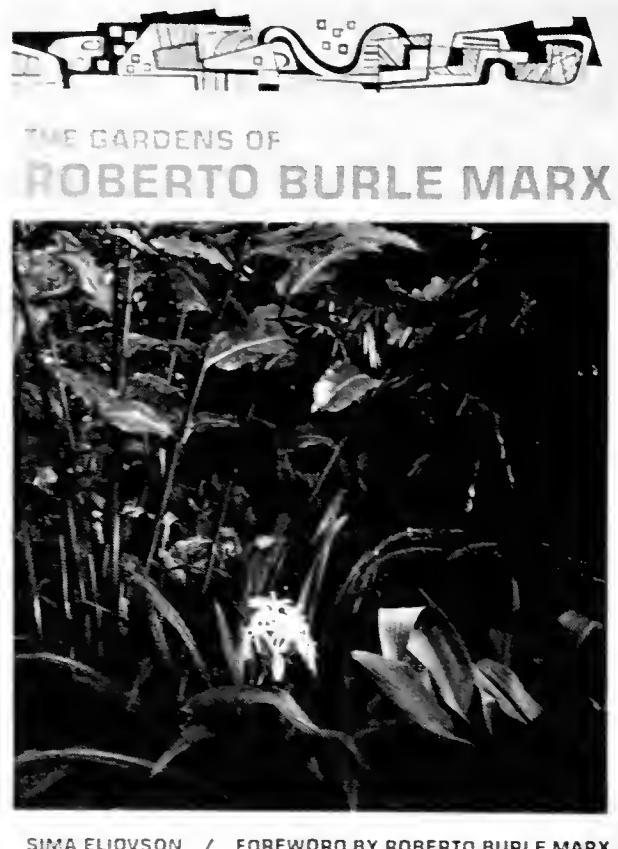
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Book Review



The Gardens of Roberto Burle Marx.
Sima Eliovson. Saga Press/Timber Press,
Portland, Oregon. 1991. 237 pages.
ISBN 0-88192-160-2. \$45.00

The name Roberto Burle Marx brings to mind images of richly textured gardens, sweeps of contrasting foliage surrounded by the verdant landscape of Brazil, and modernist abstract paving patterns. His interest in horticulture and garden design was a hobby for a young artist in the 1920s. Ironically, he discovered Brazilian flora while studying art in Berlin. This interest blossomed into a life-long passion. Trained as an artist, Burle Marx's use of plants distinctly breaks with the earlier Brazilian colonial gardens influenced by the French and Portuguese. His gardens represent a cornerstone of modernist design in landscape architecture. His work has

been inextricably linked with our images of Brazil in this century.

The Gardens of Roberto Burle Marx provides an introduction to Burle Marx and his work. The photographs and drawings illustrate the diversity of his work and his skill in the use of native plants to create gardens of a rich sculptural and textural nature. The gardens are presented in a roughly chronological order, allowing the reader to trace the development of his design skills. The reader also can follow the evolution of his increasingly bold use of plants and land form. In his work, the surrounding landscape is used as part of the garden, erasing the sense of edges and limits. The residence of Luis Cesar Fernandez is an example. His growing interest in the ecology of Brazil is illustrated by an increased use of native plant groupings which reflect native plant associations and habitat requirements. Marx's interest in native plants resulted in the establishment of a nursery where he could propagate plants for use in his gardens. In the back of the book is an index of plants mentioned in the text and a listing of significant projects.

As an introduction to Roberto Burle Marx, the book encourages further reading and a possible trip. It takes a strong will not to want to walk through the gardens and hear the sounds of leaves on leaves and smell the vegetation as the sun evaporates the morning dew. It makes the reader rethink an approach to our Northwest region and our native plants.—*Reviewed by Barbara Swift*

Barbara Swift is a landscape architect and has recently completed an essay for the Seattle Arts Commission Public Art Collection Catalog. She has written articles for *Landscape Architecture* and *Arcae*. Barbara is a new member of the editorial board of *The Washington Park Arboretum Bulletin*.

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